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IN THE APPLICATION

OF

**SOORYA DAYAL**

FOR A

**BACK TRACTION AND MUSCLE STRETCHING BENCH**

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# BACK TRACTION AND MUSCLE STRETCHING BENCH

## BACKGROUND OF THE INVENTION

### 1. FIELD OF THE INVENTION

The present invention relates to equipment for exercise and physical therapy. More specifically, the present invention is a back traction and muscle stretching bench for providing multiple traction, stretching, and exercise solutions for treating and preventing pain in the lumbar and thoracic spine and lower limb areas.

### 2. DESCRIPTION OF THE RELATED ART

Back pain is a common problem for many people. Frequently, back pain is concentrated in the lower back, or lumbar area. The lumbar area includes five large vertebrae on each side of the spine, which carry much of the body's weight. Because of its weight-supporting role, and because it is central to, and involved in, nearly every kind of body movement, the lumbar area is particularly susceptible to injuries. It is estimated that as much as 80-85% of the population suffers from lower back pain at some point in their lifetime.

The upper back (thoracic back) area is generally less prone to pain and injury. However, it can be a significant source of

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discomfort and pain when injury does occur. The most common causes of upper back pain are muscular irritation and joint dysfunction.

Numerous methods and devices have been devised to treat back injury and back pain, and to exercise and strengthen back muscles to prevent the occurrence or recurrence of pain.

U.S. Patent Publication No. 2002/0128576, published on September 12, 2002, discloses an exercise table and exercise routine useful in the treatment of low back pain. The table permits a user to apply low levels of traction to the lower back by pushing on adjustable arm support posts. The table is slightly inclined, placing a user in a slightly head-down position. The user's feet are restrained by a harness against a pair of foot pegs, so that traction is applied as the patient pushes against the arm support posts. Thus, the degree of traction applied is limited by the strength of the user. Additionally, the exercise table does not support a variety of traction, stretching, and exercise solutions for treating and preventing pain in the lumbar and thoracic spine and lower limb areas. A similar apparatus is disclosed in U.S. Patent No. 6,592,501, issued on July 15, 2003 to B. Mayes.

U.S. Patent No. 4,579,109, issued on April 1, 1986 to L. Lundblad, discloses an apparatus for treating back ailments. A

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patient support table supports a patient in a horizontal, lying position. A first belt is secured around the patient's pelvic region, while a second belt is secured around the patient's chest. Traction is applied mechanically by drive means that pull on the belts. While the disclosed apparatus is useful for a variety of traction therapies, it is dependant on electrical power to operate the drive means, and does not serve to facilitate stretching or exercise solutions either individually or in conjunction with the traction.

U.S. Patent No. 5,472,401, issued on December 5, 1995 to M. Rouillard et al., discloses a ramped and horizontal stretching bench for relieving spinal and muscle conditions contributing to back pain. A user lies on the bench with his upper torso on a horizontal section of the bench, with his lower torso and legs extending downward along a ramped portion of the bench. The stretching bench relies on gravity to pull the user's legs and lower torso, relieving tightness and tension in the muscles and vertebrae in the user's back.

U.S. Patent 5,050,589, issued on September 24, 1991 to R. Engle, discloses an apparatus and method for performing extension and flexion of a knee joint, wherein the patient is in a prone position on an inverted V-shaped table. The inverted V-shaped table is adjustable to vary the inclination of both the

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patient's torso and the patient's legs. The apparatus is intended for use with an iso-kinetic rehabilitation machine that is not part of the apparatus. The apparatus provides no features to apply or enhance traction to the lower back or other body regions.

U.S. Patent Publication No. 2002/0095182, published on July 18, 2002, discloses a physiotherapy bench including a body supporting panel supported on a frame. The body supporting panel includes a substantially horizontal front end for supporting the chest of a patient, and an inclined rear end for supporting the patient's hips and upper legs. A patient is subjected to a gentle traction while positioned on the bench. A headrest and arm supports are provided for the patient's comfort while using the device. The body supporting panel, however, is not adjustable in inclination, restricting its use to a single position. Additionally, the apparatus provides no features to enhance the traction that results simply from gravity, or to use the apparatus in varied positions.

U.S. Patent No. 5,989,168, issued on November 23, 1999 to L. See, discloses an exercise bed that is composed of a front and rear frame pivotally fastened together. A transmission motor is connected to the frame, and functions to raise the center of the bed, thereby bracing and extending the backbone of

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a person lying on the bed. Padded rollers support a user's legs and retain the feet in position as the bed operates.

U.S. Patent 5,840,001, issued on November 24, 1998 to R. Schedel, discloses a therapy table that separately supports the lower and upper body of a user. The table is movable between a vertical position, wherein a user can easily mount the device, and an essentially horizontal position in which the user may perform selected exercises. The upper body-supporting portion of the table is pivotal relative to the lower body-supporting portion of the table. Electrical or hydraulic actuators position the table. A leg-locking pad retains the user's legs during use. The table does not facilitate side-to-side movement of the torso during use.

None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed. Thus, a back traction and muscle stretching bench solving the aforementioned problems is desired.

## SUMMARY OF THE INVENTION

The back traction and muscle stretching bench of the present invention provides multiple traction, stretching, and exercise solutions for treating and preventing pain in the lumbar and thoracic spine and lower limb areas. A variety of

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traction and stretching therapies, in prone and supine positions, are facilitated, both individually and in combination.

A sturdy base frame supports a padded thigh support board and a padded torso support board. The torso support board is adjustable from a generally horizontal position to a position angled downward toward the front. The thigh support board is fixed in a position angled slightly downward toward the rear. Thus, a patient may lie on the back traction and muscle stretching bench in a prone position with thighs supported on the thigh support board, torso supported on the torso support board, and legs extending to the rear.

A leg support extends rearward from the base frame, and includes a pair of footrest plates and a pair of padded leg support rollers. The footrest plates and the leg support rollers are adjustable both in their extension from the base frame and in their vertical height. A patient in the prone position may position his or her legs underneath the leg support rollers to apply traction to the lumbar region. The degree of traction applied may be adjusted, by moving the leg support into a more downward position to increase, or into a more upward position to decrease, the force applied. Traction may also be varied by adjusting the downward angle of the torso support

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board. Additionally, increasing the downward angle of the torso support board decreases static pressure on the back caused in patients with a large stomach or abdomen, such as in overweight patients.

In one embodiment of the back traction and muscle stretching bench, the torso support board pivots horizontally from side to side. This allows a patient to perform lateral stretching of lower back muscles, and is beneficial for treatment of certain types of nerve compression in the lumbar area.

Arm support stands extend to the front of the bench, providing both an arm rest and a handhold for each arm. The arm support stands are adjustable in position and height. The arm support stands provide handholds for the patient to grasp for stability and comfort, and to aid in stretching the body during treatment. The arm support stands also provide support for the patient during push-up like exercises.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is an environmental, perspective view of a back traction and muscle stretching bench according to the present invention, showing a user engaged in a first traction therapy.

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Fig. 1B is a perspective view of a back traction and muscle stretching bench according to the present invention.

Fig. 1C is an environmental, perspective view of a back traction and muscle stretching bench according to the present invention, showing a user engaged in a second traction or stretching therapy.

Fig. 1D is an environmental, perspective view of a back traction and muscle stretching bench according to the present invention, showing a user engaged in a third traction or stretching therapy.

Fig. 2 is a side elevational view of a back traction and muscle stretching bench according to the present invention.

Fig. 3 is a perspective view of a base frame for a back traction and muscle stretching bench according to the present invention.

Fig. 4 is a perspective view of a torso support frame for a back traction and muscle stretching bench according to the present invention.

Fig. 5 is a perspective view of an adjustment screw for adjusting the inclination of a torso supporting portion for a back traction and muscle stretching bench according to the present invention.

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Fig. 6 is a perspective view of an arm supporting assembly for a back traction and muscle stretching bench according to the present invention.

Fig. 7 is a perspective view of a leg supporting assembly for a back traction and muscle stretching bench according to the present invention.

Fig. 8 is a perspective view of a thigh support panel for a back traction and muscle stretching bench according to the present invention.

Fig. 9 is a perspective view of a torso support panel for a back traction and muscle stretching bench according to the present invention.

Fig. 10 is a perspective view of a pivoting torso support panel for a back traction and muscle stretching bench according to the present invention.

Fig. 11 is a top view of a back traction and muscle stretching bench with a pivoting torso support panel according to the present invention.

Similar reference characters denote corresponding features consistently throughout the attached drawings.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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The present invention is a back traction and muscle stretching bench, designated generally as 10 in the drawings. Referring to Figs. 1A-1C, and 2, the back traction and muscle stretching bench 10 allows a user U to engage in various stretching and traction therapies and strengthening exercises, particularly those suited to treating and preventing middle and lower back and lower limb pain.

The back traction and muscle stretching bench 10 comprises a thigh supporting bench panel 800 and a torso supporting bench panel 700 disposed on a base frame 100. The thigh supporting bench panel 800 is inclined downward toward the rear of the base frame 100. In the present embodiment, the torso supporting bench panel 700 is mounted onto a torso frame 200 that is connected to the base frame 100 by at least one hinge. In alternate embodiments, the torso supporting bench panel 700 could be a single, self-supporting panel itself directly hinged to the base frame 100. An adjustment mechanism 300, disposed between the base frame 100 and the torso frame 200, holds the torso supporting bench panel 700 at a position that is adjustable between generally horizontal to a position inclined downward towards the front of the base frame 100.

Belts secure the user U in position during traction therapies, and apply variable tension to selected regions of the

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back. Fixed belts 220 are attached to the base frame 100 and torso frame 200, and are adjustably joined with belt clasps or a hook and loop fastener. In Fig. 1A, fixed belts 220 are shown secured around the torso and lower back of the user U. The fixed belts 220 are fastened together around the user's torso with a hook and loop fastener or belt clasps. Tensionable belts 221, seen in Figs. 1B and 1C, are attached to tensioning belt 219, preferably by a hook and loop fastener for flexibility, the tensioning belt 219 in turn being attached to a belt tensioner 210. As seen in Fig. 1C, the tensionable belts 221 are wrapped around the torso of the user U and fastened together with a hook and loop fastener or belt clasps. The tensionable belts 221 may be positioned along the user's spine to more precisely locate the application of traction.

These basic components of the back traction and muscle stretching bench 10 provide an exercise and therapy bench that has an inclined bench panel to support the thigh area of a user in a prone position on the bench, and a bench panel for supporting the user's torso in a horizontal to downwardly inclined position.

With a user U lying prone on the back traction and muscle stretching bench 10 as shown in Fig. 1A, with the torso supporting bench panel 700 in a downwardly inclined position to

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place the user U in an inverted "V" position slightly bent at the waist, a degree of stretching and traction is applied to the spine as a result of the user's position and gravity acting on the user's extended legs. Varying the downward incline of the torso supporting bench panel 700 varies the degree and effect of the treatment.

In addition, incrementing the downward force on the user's legs increases the degree of traction applied. A leg support assembly 600 extends rearward from the base frame 100, and provides both foot rests 604 and leg roller pads 608. The roller pads 608 may be used to add such an additional downward force on the user's legs, thereby increasing the degree of traction applied to the user's spine. In use, with the user U lying prone on the back traction and muscle stretching bench 10, the user's legs are placed under the roller pads 608 with the rollers positioned generally along the user's calves. The leg support assembly 600 is pivotally adjustable to vary the vertical position of the roller pads 608. Adjusting the leg support assembly 600 to place the roller pads 608 into a lower position increases the downward force on the user's legs, thereby increasing traction. Traction is decreased with the roller pads 608 positioned higher.

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In order to provide for user comfort, as well as to provide arm support and handholds during various therapies and exercises, an arm support assembly 400 extends forward from the base frame 100. The arm support assembly 400 provides a pair of armrests 410 and handgrips 418. The armrests 410, along with the handgrips 418, are adjustable in height. The user U may use the armrests 410 along with the handgrips 418 to perform push-ups and similar exercises, or may use the handgrips 418 to pull, thereby creating additional stretching or traction during an exercise or treatment. The armrests 410 and the handgrips 418 are also useful in mounting and dismounting the equipment.

A chin rest 504 is provided on an adjustable arm 502 attached to and extending forward from the torso frame 200. The chin rest 504 is useful for head and neck support for a tall user, or when the user U is positioned on the back traction and muscle stretching bench 10 in a more forward position.

Referring to Fig. 1D, the back traction and muscle stretching bench 10 is shown with an alternative, pivoting torso supporting bench panel 900 in place of the torso supporting bench panel 700. The pivoting torso supporting bench panel 900 allows the user U to move from side to side, allowing lateral stretching of the back muscles and spine. Such a sideways stretching is helpful in treating certain types of nerve

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compression in the lumbar area, including a herniated disk or other kinds of nerve compression.

Turning now to Fig. 3, the base frame 100 is illustrated in greater detail. A rectangular or trapezoidal thigh bench frame 114 has a pair of front legs 106 and a pair of rear legs 102. In the present embodiment, the thigh bench frame 114 is an isosceles trapezoid, having its base 116 at the rear of the base frame 100. Rear legs 102 depend from the base 116 of the thigh bench frame 114, and front legs 106 depend from the front of the thigh bench frame 114. A cross member 104 joins the bottom ends of the rear legs 102, the rear legs 102 being generally vertical, and in a generally parallel and spaced apart relationship to one another. Horizontal leg members 108 extend forward from the bottoms of the front legs 106, and are adapted to rest on a floor surface, giving the back traction and muscle stretching bench 10 a sturdy and stable foundation. The horizontal leg members 108 are joined in a generally parallel and spaced apart relationship to one another by a cross member 110.

A bracket 112 is disposed on the cross member 110 for attachment of the adjustment mechanism 300, as seen on Fig. 1B. Hinge members 122 are disposed on the front of the thigh bench frame 114 for mounting of the torso frame 200. The hinge

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members 122 engage with hinge members 208 on the torso frame 200, seen in Fig. 4 (hinge pins are not shown). A bracket 118 is disposed on the rear of the thigh bench frame 114, for mounting the leg support assembly 600.

Turning now to Fig. 4, the torso frame 200 is shown in greater detail. Seen from below in Fig. 4, the torso frame 200 comprises essentially an elongated rectangular or trapezoidal frame having a front end 201, a rear end 202, and two opposing sides 203. Hinge members 208, disposed on the rear end 202 of the torso frame 200, engage with hinge members 122 on the thigh support frame 114, seen in Fig. 3 (hinge pins are not shown). A crossbar 204 extends transversely between sides 203 of the torso frame 200. A bracket 206 is disposed on the crossbar 204 for attachment of the adjustment mechanism 300.

A mounting assembly 222, disposed at the rear end 202 of the torso frame 200, allows for the attachment of the torso supporting bench panel 700 to the torso frame 200. The mounting assembly includes an aperture 224 that will receive a pivot pin 708, and an arcuate slot 226 that will receive a clamping pin 710 (shown in Fig. 9).

A plurality of belt loops 218 are disposed on the sides 203 of the torso frame 200. Fixed belts 220 are attached to the belt loops 218. Tensionable belts 221, in connection with

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tensioning belt 219, run along the top of the torso supporting bench panel 700 or are channeled through belt loops 218. The tensionable belt 219 is attached to a belt tensioner 210 that is disposed on the front end 201 of the torso frame 200. A ratchet mechanism 212 selectively engages or disengages with the belt tensioner 210 to secure the belt tensioner 210 in place as a belt 221 is tightened, or to release the belt tensioner 210 when a belt 221 is to be released. The belts 220 and 221 are configured to fasten around the body of a user to hold the user in place on the back traction and muscle stretching bench 10, as well as to provide pressure against selected portions of the spine during various treatments.

A lateral support arm 214 is pivotally disposed on each side 203 of the torso frame 200. Each lateral support arm 214 may be pivoted between a position generally flush alongside the side 203 of the torso frame 200 and a position generally perpendicular to the torso frame 200. The lateral support arms 214, in their extended position, support a pivoting torso bench member 900 as it pivots from side to side (discussed below in reference to Fig. 11).

Turning now to Fig. 5, the adjustment mechanism 300 is shown in greater detail. The adjustment mechanism 300 comprises a threaded shaft member 302, disposed partially within and

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partially extending from a cylinder 306, the cylinder 306 having an upper end 308 and a lower end 310. An adjusting handle 312 has an internally threaded hub 314 threadably engaged about the threaded shaft member 302, whereby turning the adjusting handle 312 extends the threaded shaft member 302, or retracts the threaded shaft member 302 into the cylinder 306. The hub 314 of the adjusting handle 312 abuts the upper end 308 of the cylinder 306. As seen in Fig. 2, the adjustment mechanism 300 is disposed between the torso frame 200 and the base frame 100, with the threaded shaft member 302 adapted to engage with bracket 206 and the lower end 310 of the cylinder 306 adapted to engage with bracket 112. The adjustment mechanism 300 allows the inclination of the torso frame 200 to be varied.

Turning now to Fig. 6, the arm support assembly 400 is shown in greater detail. Horizontal leg members 402 are joined together by a cross bar 404 at the front end of the assembly, the horizontal leg members 402 being in a generally parallel and spaced apart relationship to one another. The horizontal leg members 402 are adapted to rest on a floor surface, giving the arm support assembly 400 a sturdy and stable foundation. A pair of first upright members 408 are attached to, and extend vertically from, the horizontal leg members 402. The first upright members 408 are tubular, and have a hollow interior. A

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second upright member 412 telescopically extends upward from each of the first upright members 408. An armrest assembly 410 is disposed on the top end of each of the second upright members 412. Each arm rest assembly comprises a plate 414, a padded arm rest 416 disposed on the plate 414, and a hand grip 418 disposed on the plate 414. As shown in Fig. 1B, the arm support assembly 400 engages with the base frame 100 with the horizontal leg members 402 of the arm support assembly 400 telescopically engaged with the horizontal leg members 108 of the base frame 100. A handle 406, disposed on the crossbar 404, facilitates positioning and adjustment of the arm support assembly 400. The height is adjusted by inserting a pin through aligned holes in the first and second telescoping upright members 408 and 412.

Turning now to Fig. 7, the leg support assembly 600 comprises a support arm 602 that extends rearward from the base frame 100 (see Fig. 2). The support arm 602 is an elongated arm having a first end 601 that engages with bracket 118 on the base frame 100, and a second end 603 extending rearward. The support arm 402 supports a pair of footrests 604 and at least a pair of roller pads 608. The footrests 604 are connected to the leg support assembly 600 by a clamp 606 that allows the footrests 604 to be adjustably positioned along the support arm 602. Similarly, the roller pads 608 are connected to the leg support

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assembly 600 by a clamp 610 that allows the roller pads 608 to be adjustably positioned along the support arm 602. Typically, the leg support assembly 600 is configured with the footrests 604 positioned near the second end 603 of the support arm 602, and the roller pads 608 generally midway between the first end 601 of the support arm 602 and the footrests 604.

Turning now to Fig. 8, the thigh supporting bench panel 800 is a padded bench panel disposed on the base frame 100 as seen in Fig. 1B. The thigh supporting bench panel 800 may be a single molded panel, or a rigid planar panel member, such as plywood, having a padded covering. Similarly, a torso supporting bench panel 700, seen in Fig. 9, is a padded bench panel disposed on the frame 200 as seen in Fig. 1B. The torso supporting bench panel 700 may be a single molded panel, or a rigid planar panel member, such as plywood, having a padded covering. The torso supporting bench panel 700 is an isosceles trapezoid having a base 702, sides 704, and a forward end 706. The torso supporting bench panel 700 is mounted onto the torso frame 200 by a pivot pin 708, that engages with aperture 224 on the torso frame 200, and a clamping pin 710, that engages with the arcuate slot 226 on the torso frame. Clamp 712, threadably engaging the clamping pin 710, may be tightened to secure the torso supporting bench panel 700 in position.

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In an alternate embodiment shown in Figs. 10 and 11, a pivoting torso supporting bench panel 900 is similar to the torso supporting bench panel 700, having a base 902, sides 904, and a forward end 906, except that the base 902 is V-shaped to allow the pivoting torso supporting bench panel 900 to pivot on the torso frame 200 from side to side of the base frame 100. A pivot pin 908, which engages with aperture 224 on the torso frame 200, and a clamping pin 910, which engages with the arcuate slot 226 on the torso frame, mount the pivoting torso supporting bench panel 900 onto the torso frame 200. Clamp 912, threadably engaging the clamping pin 910, may be tightened to secure the torso supporting bench panel 900 in position. With the clamp 912 untightened, the V-shape of the base 902 of the pivoting torso supporting bench panel 900 allows the pivoting torso supporting bench panel 900 to be freely pivoted from side to side of the base frame 100. Lateral support arms 214, pivotally disposed on the sides 203 of the torso frame 200, extend to support the pivoting torso supporting bench panel 900 as it pivots from side to side.

It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

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